SensorRail™ IIIE ADRL3TRK Series

SpeedDome® Ultra Programmable Dome on a Rail

Service Guide

CAUTION: Only a certified installer is authorized to install this equipment. Installation by anyone else will void the SensorRail warranty.

Contents

About this Guide

This guide explains how to service the SensorRail IIIE system. However it does not explain:

- How to repair or replace components on the CPU board.
- How to program or operate the system. Refer to SensorRail IIIE User Guide 8200-0593-04.
- Product specifications. Refer to SensorRail IIIE Installation Guide 8200-0593-02.

If you need assistance, contact...

American Dynamics Technical Services

United States:
Toll Free 800-507-6268, Option 2
International: 561-912-6259, Option 2
Fax: 845-624-7658

In Europe:
Technical Services at EMEA AD Technical Support
+800 CALL TYCO or (+800 22 55 8926)
From the UK: 08701 238 787
Direct: +31 475 352 722
Fax: +31 475 352 725
Hours: 09:00–17:00 CET-EET-GMT

About the Product

The SensorRail IIIE system enables a SpeedDome Ultra dome camera to transmit video as it moves along a rail to the ideal surveillance position.

The system consists of:

- 2.5m rail sections (number determined by the total length of the rail) with installation hardware
- A light reducing section at each end of the rail
- Ceiling suspension assembly, which includes M8 threaded rods, ceiling attachment hardware (not supplied), and mounting stirrups
- Copper tracks
- Camera trolley with dome camera, RF transmit antenna, and motor
- PowerRail module that supplies dc power to the camera trolley, converts RS-422 data to RS-232 data used by the trolley, and receives the video signals from the dome camera
- Trolley stop and retrieval tool
- RF receive antenna.

Theory of Operation

Trolley CPU

The CPU in the trolley filters command data from a matrix switcher or controller. Movement along the rail is accomplished by sending an IRIS or FOCUS command. This command is sent to the dome camera by the matrix switcher, which the trolley CPU converts to left and right instructions.

Note: To the matrix switcher, the trolley CPU board is transparent. However, some commands are delayed compared to what is typical for a dome camera's response.

This section describes the CPU to help you perform maintenance efficiently. It does not provide detailed information on internal electronic components.

Board Layout

Refer to figures on pages 7 and 8.

The CPU board manages all trolley functions. The main CPU functions and components are as follows:

- **Main connector:** Provides power to the motor and receives data from the encoder and the dome (RS-422 bi-directional communication).
- **Power connector**: Receives 27Vdc and RS-232 data provided by the four sliding collectors.
- **Five LEDs:** Enable quick diagnostics in case of technical problems.
- **RF 2.4GHz transmitter board:** Replaceable by removing four soldered attachment points.
- **RF 2.4GHz emitter connector:** Provides power and composite video signal to RF link emitter.
- **BNC connector:** Receives composite video signal from the dome.
- **ATMEGA 128 microcontroller:** Receives all external data and drives the motor.
- **Electronic brake devices:** A relay and a resistor that slow the motor by applying resistance to the motor.
- **Optical sensors:** Detect optical strips at the beginning and the end of the rail.
- **JTAG connector and DIP switches:** Used for factory programming and future features.

CPU Connections

Power connector (J1)

Pin	Function
1	27Vdc
2	0V
3	RS-232 TX
4	RS-232 RX

Main connector (J2)

Pin	Function
1	Not used
2	RS-422 TX– to Dome
3	RS-422 TX+ to Dome
4	RS-422 R to Dome
5	RS-422 RX+ to Dome
6	27Vdc to Dome
7	0V to Dome
8	VB channel (encoder)
9	5Vdc to Encoder
10	VA channel (encoder)
11	SC Synchro (encoder)
12	Not used
13	Motor –
14	Temp probe (future)
15	Not used
16	Motor +

Transmitter connector

Pin	Function
1	5Vdc
2	GND
3	12Vdc
4	GND
5	Composite video IN
6	GND

ATMEGA 128 Microcontroller

Note: The following information refers to diagrams on pages 8 through 10.

The CPU is an ATMEGA 128, a low-power CMOS, 8-bit micro (µP) controller based on AVR enhanced RISC architecture.

- The ATMEGA 128 combines a rich instruction set with 32 general-purpose working registers.
- By executing powerful instructions in a single clock cycle, the ATMEGA 128 achieves throughputs approaching 1MIPS per MHz.
- Matrix switcher commands are received through Port E (PE0, PE1) of the ATMEGA 128. Then, IRIS or FOCUS codes extracted from the data frame activate PWM drivers through
  - Port B (PWM = motor speed),
  - Port C (Cmd = CW or CCW rotation), (Disable = motor ON or OFF), and (Brake).
- All remaining data from the frame are sent directly to the dome camera through Port D (PD2, PD3) using an RS-232 / RS-422 full duplex converter.
- All the 32 registers connect to the Arithmetic Logic Unit (ALU), enabling access to two independent registers in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The ATMEGA 128 µP has the following features:

- 128K bytes of in-system programmable flash with read-while-write capabilities
- 4Kb EEPROM
- 4Kb SRAM
- 53 general-purpose I/O lines
- 32 general-purpose working registers
- Real-time counter (RTC)
- 4 flexible timer/counters with compare mode and PWM
- 2 UARTs
- Byte oriented two-wire serial interface
- 8 channel, 10-bit ADC with an optional differential input stage having programmable gain
- Programmable watchdog timer with internal oscillator
- SPI serial port
- IEEE 1149.1 STD. compliant JTAG test interface (also used for accessing the on-chip debug system and programming)
- 6 software-selectable power saving modes
- On-chip ISP flash enables program memory to be reprogrammed in-system through an SPI serial interface, conventional nonvolatile memory programmer, or on-chip boot program running on the AVR core.
- Boot program can use any interface to download the application program in the application flash memory
- Software in the boot flash section continues to run while the application flash section is updated, providing true read-while-write operation.

The device is manufactured using Atmel's high-density, nonvolatile memory technology.

ATMEGA 128 pin description

Pin	Description
VCC	Digital Supply Voltage
GND	Ground
Port A (PA7…PA0) Port B (PB7…PB0) Port C (PC7…PC0) Port D (PD7…PD0) Port E (PE7…PE0) Port F (PF7…PF0)	These ports are 8-bit, bi-directional I/O ports with internal pull-up resistors (selected for each bit). Their output buffers have symmetrical drive characteristics with high sink and source capability. As inputs, these ports pins externally pulled low will source current if the pull-up resistors are activated. Their pins are tri-state when a reset condition becomes active, even if the clock is not running. **Note:** Port F also serves as the analog input to the A/D converter. If the JTAG interface is enabled, the pull-up resistors on pin PF7 (TDI), PF5 (TMS) and PF4 (TCK) activate even if a reset occurs. The TDO pin is tri-state unless TAP states that shift out data are entered. Port F also serves functions of the JTAG interface.
Port G (PG7…PG0)	Port G is a 5-bit, bi-directional I/O port with internal pull-up resistors (selected for each bit). Port G output buffers have symmetrical drive characteristics with high sink and source capability. As inputs, Port G pins externally pulled low will source current if the pull-up resistors are activated. Port G pins are tri-state when a reset condition becomes active, even if the clock is not running.
RESET	A low level on this pin for longer than the minimum pulse length generates a reset, even if clock is not running.
XTAL1	Input to the inverting oscillator amplifier and internal clock operating circuit.
XTAL2	Output from the inverting oscillator amplifier.
AVCC	A/D converter externally connected to Vcc.
AREF	Analog reference pin for the A/D converter.
PEN	Programming enable pin for the SPI serial programming mode. Holding this pin low during a power-on reset causes the device to enter the SPI serial programming mode. PEN has no function during normal operation.

Motor Command

When the ATMEGA microcontroller receives an IRIS or FOCUS command, it sends one of four output signals to the PWM driver (sampling frequency is 25kHz).

- **PWM:** Digital value directly related to the movement speed of the trolley (1–256 steps).
- **Cmd (0 or 1):** Value related to the rotation (CW or CCW) depending on the known position of the trolley along the rail as given by the encoder.
- **Disable (0 or 1):** Value used to inhibit or not inhibit PWM drivers (motor ON or OFF).
- **Brake (0 or 1):** Value used to command the relay of the brake device. To slow and stop the motor, the relay turns off and a dissipative resistor shunts the motor. During the braking process, the motor is disconnected from power.

Speed is maintained using rotation pulses and the synchronization top pulse from the encoder, fixed to the motor, the encoder sends 500 pulses per rotation through its channel plus a synchronization top pulse per rotation.

Several speeds are available depending on commands sent to the µP:

- Manual nominal speed: 3m/s (9.84ft/s)
- Initialization speed: 1m/s (3.28ft/s)
- Patrol mode: 1.5m/s (4.92ft/s)
- Preset speed: 6m/s (19.69ft/s)
- Preset positioning speed: 0.3 m/s (0.98ft/s)

One motor rotation corresponds to a 7.8125cm (3.08in) movement along the rail. For example, when the trolley is moving along the rail at 1m/s (3.28ft/s), the motor rotates at 12.8RPS (768RPM).

A 16-bit internal counter performs the speed calculation. The counter is incremented by the VA channel from the encoder and read once every 10ms.

Speed is calculated by comparing the difference between two counter readings multiplied by 100, and then divided by 64. For example (speed in cm/s): 100 cm/s = 768 RPM = 384000 pulses/min = 6400 pulses/sec = 64 pulses/10ms.

The PWM value update (real speed of the trolley comparing the user requested speed) is performed once every 0.5 sec.

Trolley Positioning

In addition to speed regulation, the motor encoder also performs trolley positioning. As stated previously, one motor rotation corresponds to a 7.8125cm (3.08in) movement along the rail. Motor rotation is also equal to 128 rotations per 10 meters of movement.

At maximum motor speed, the encoder sends a TOP_SYNC signal once every 7.3ms and the 16-bit internal counter increments every 7.3ms. However, if the duration between two pulses is less than 6ms, it is considered a false reading and is not used.

Using the above specifications as a reference point, trolley position is determined by counting motor rotations (using the TOP_SYNC signal from the encoder) and by comparing current and previous counter values.

Counter increment or decrement is performed according to trolley movement (forward or backward). Trolley direction is known by the software and confirmed by a SENS signal.

Two optical sensors (A and B) detect the pass-by from one rail section to another and also recognize the start and end of the rail. The start of the rail is detected only by sensor A and the end of the rail is detected by both sensors (A and B). Sensor B also detects a spot label positioned at the end of each track section.

The ability to differentiate the start and end of the rail in conjunction with the new positioning system enables the trolley to move even when the optical strips are reached and thus reduce the length of the dead zone.

A built-in odometer records trolley movement in kilometers. This measurement is performed by incrementing a counter at the TOP_SYNC pulse independent of direction. When the value reaches 640000, the odometer increments by 1.

I Max Circuit

To avoid burning up the motor due to electrical over current, an “I Max” circuit is installed on the CPU. This circuitry provides feedback of 0.6V per ampere (with an extreme limitation of 5.2A). If over-current is detected, the trolley sends a disable command (PC3-Port C) to the PWM drivers to stop the trolley motor.

On-board Adjustments

The CPU board does not have any adjustments.

Port Assignments

Port assignments related to trolley functions are as follows:

Port A:	Not used
Port B:	PBO to PB6: (not used) PB7: PWM (motor speed control)
Port C:	PC0: Default LED 2 (lit when a default occurs; motor is disabled) PC1: CMD (determines the CW or CCW rotation of the motor) PC2: default LED 1 (lit when a default occurs; motor is disabled) PC3: DISABLE (motor ON or OFF) PC4: not used PC5: BRAKE (Motor brake ON or OFF) PC6 and PC7: not used
Port D:	PD0: B channel from the encoder PD1: A channel from the encoder PD2: RX from Dome (through RS232/RS422 converter) PD3: TX to Dome (through RS232/RS422 converter) PD4: TOP_SYNC from the encoder PD5: not used PD6: A channel from the encoder PD7: not used
Port E:	PE0: RX from the matrix PE1: TX to the matrix PE2: not used PE3: Watchdog (voltage critical value 20V +/- 13%) PE4: not used PE5: Optical sensor A PE6: not used PE7: Optical sensor B
Port F:	PF0: Temperature sensor (not used) PF1: Not used PF2: I Max measurement PF3: Not used PF4: JTAG TCK (for firmware update purposes) PF5: JTAG TMS (for firmware update purposes) PF6: JTAG TDO (for firmware update purposes) PF7: JTAG TDI (for firmware update purposes)
Port G:	Not used

RF 2.4GHz Link and Planar Antenna

- The RF emitter is built into the trolley CPU and the receiver into the PowerRail (see PowerRail section).
- This RF system has five channels to address potential interference with other 2.4GHz devices such as bar code scanners.
- The trolley also supports 5.8GHz. The optional 5.8GHz antenna kit is for use in countries that authorize this frequency.

PowerRail

The PowerRail module:

- Provides power and data to the rail
- Supports power conversion from 90-240Vac 50/60HZ to 24Vdc/5A
- Supports data conversion from RS-422 to RS-232
- Includes the RF video link receiver and planar receiving antenna
- Direct connection through the DB29 plug enables product configuration and troubleshooting, using a laptop and AD SensorRail Control software
- Main power connection is through an IEC connector that includes an AC filter
- Data connects through a standard 4-position terminal (RS-422) and a 3-position terminal (RS-232).

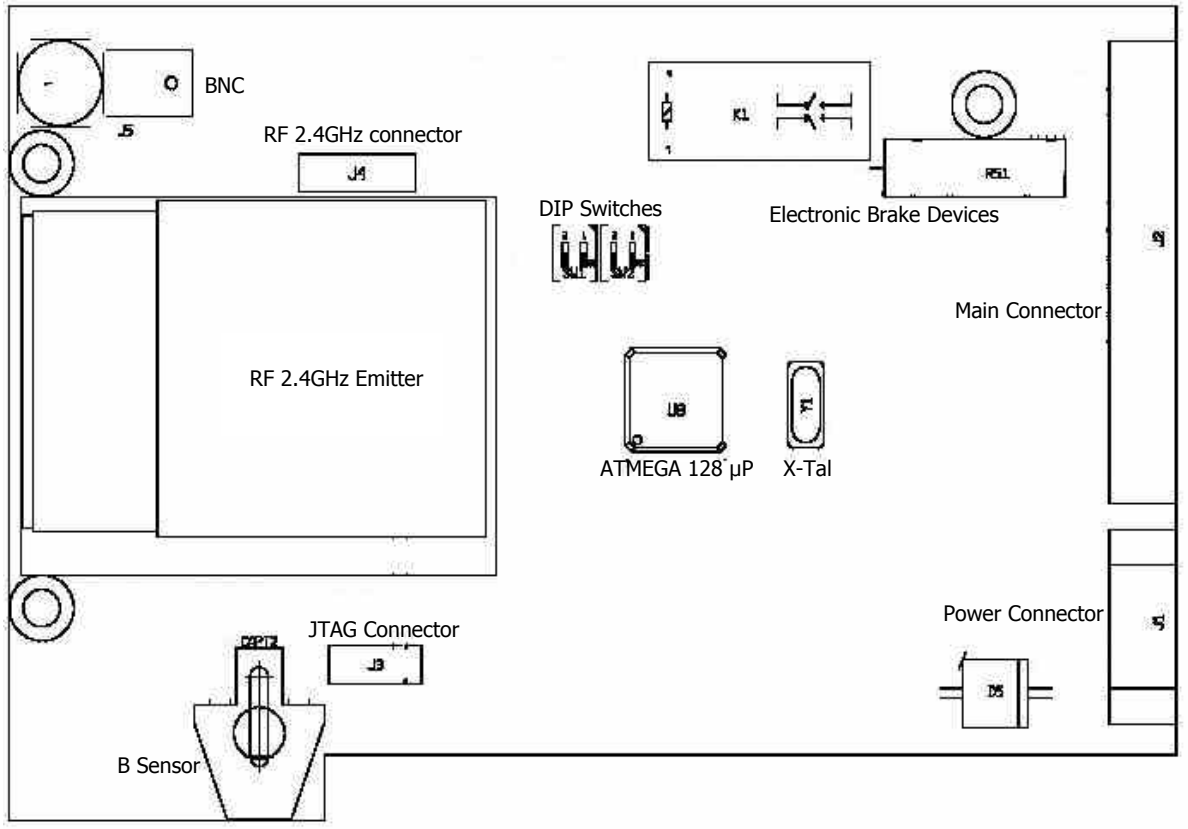
Vision Area, Dead Zone, and Maintenance Area

Vision Area: Is the area in which the trolley will be able to move. It is equal to the total length of the rail minus the “dead zones”.

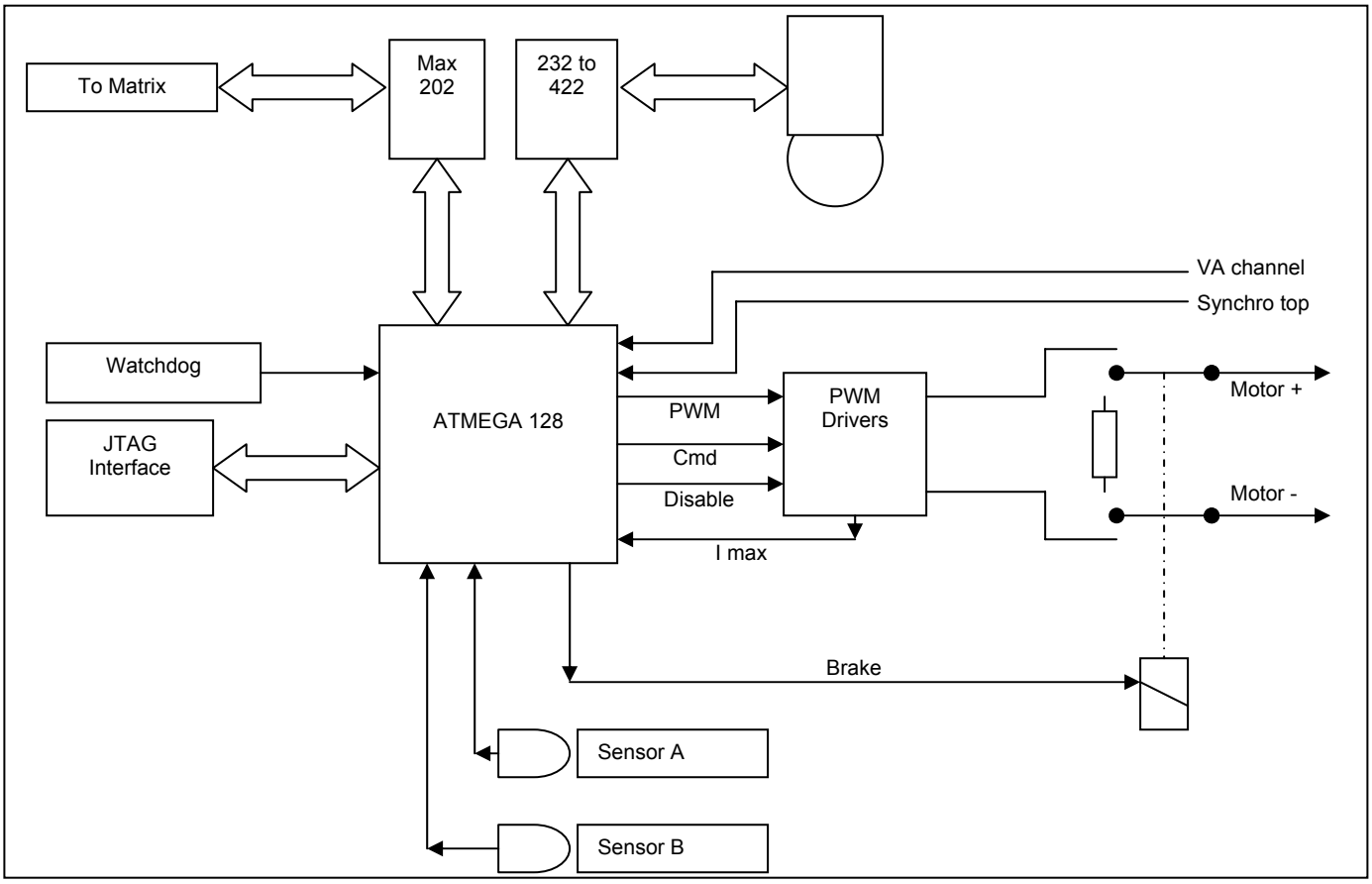
Dead Zone: Is the 1.5m (5ft) zone at each end of the rail. This zone allows the trolley to safely stop in case of a positioning management system failure.

Maintenance Area: Is the 0.6m (2ft) area at each end of the rail. This area enables the trolley to be removed from the rail for repair or replacement.

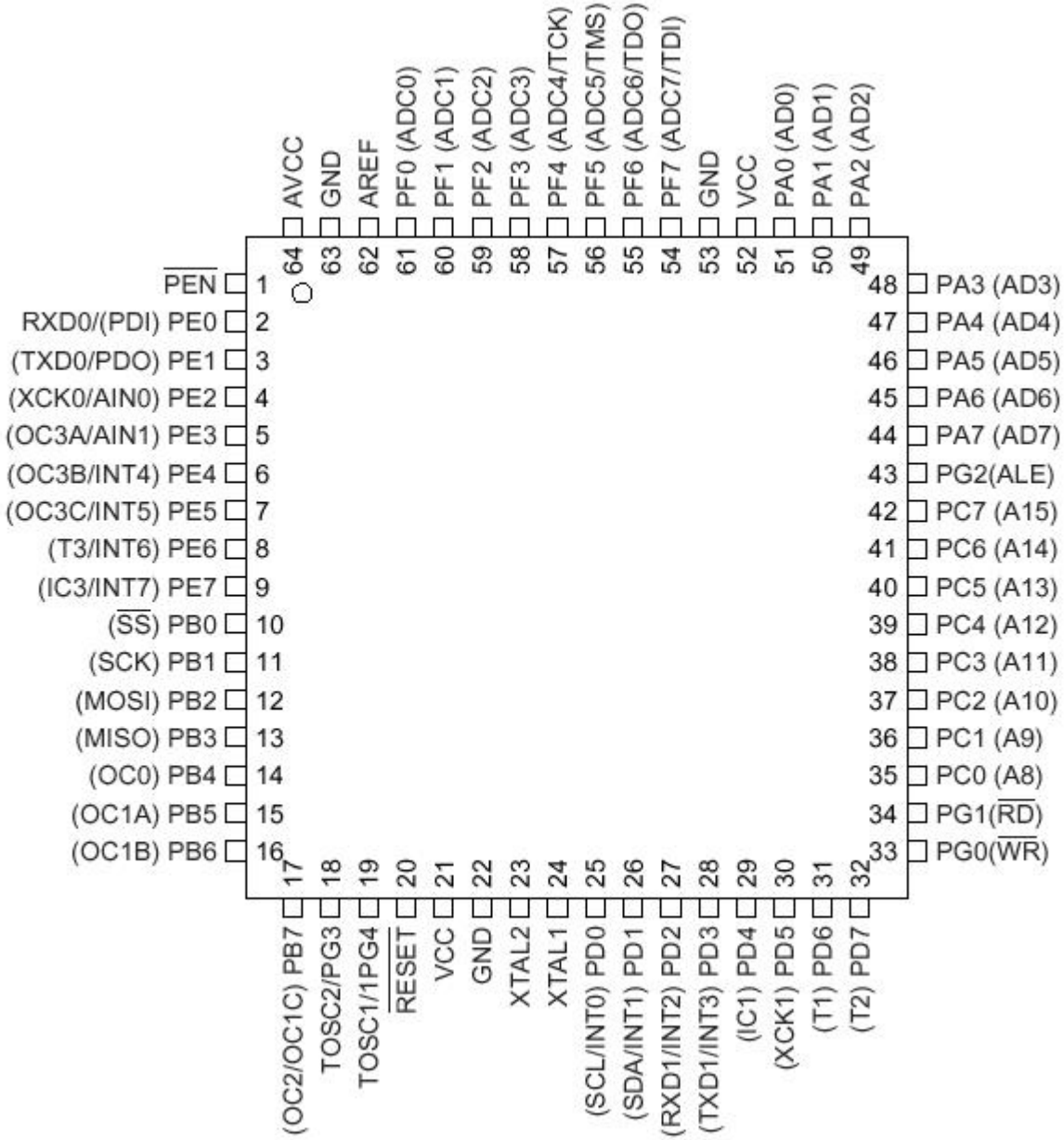
CPU Board Layout



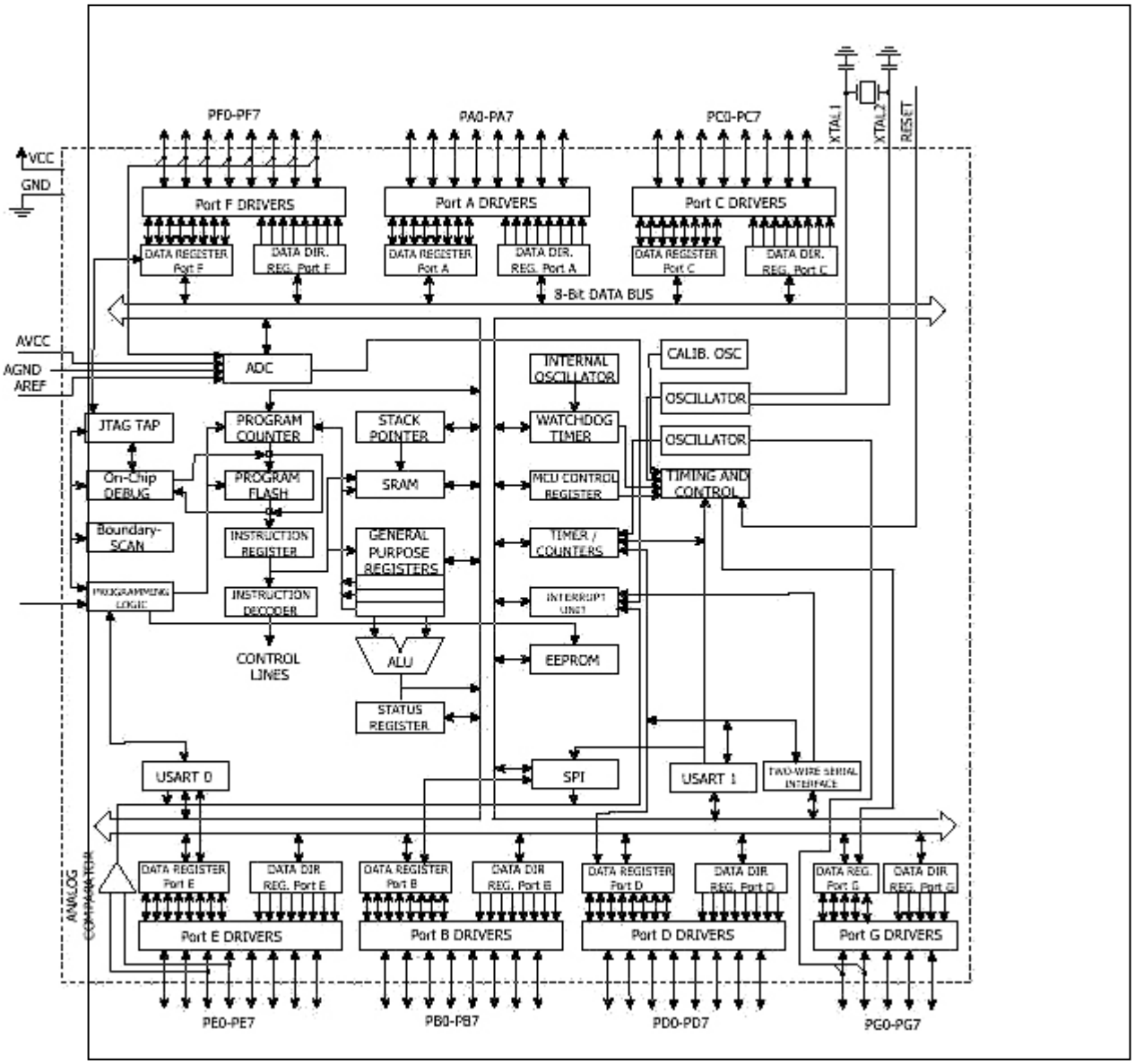
Trolley Circuit Block Diagram



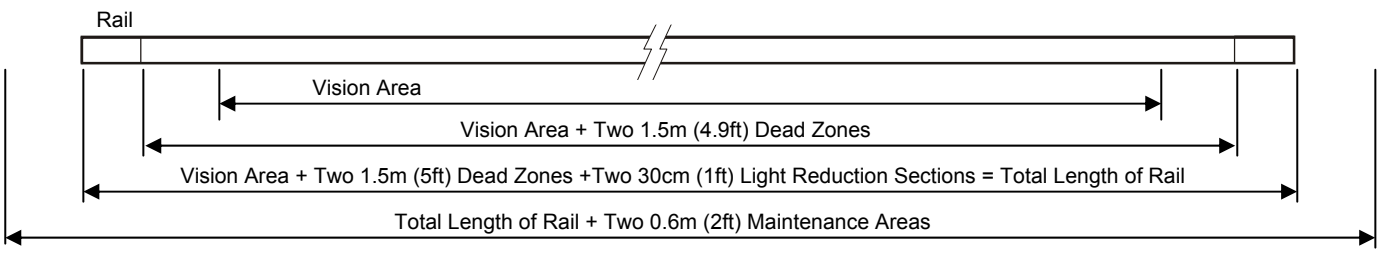
ATMEGA Pin configurations



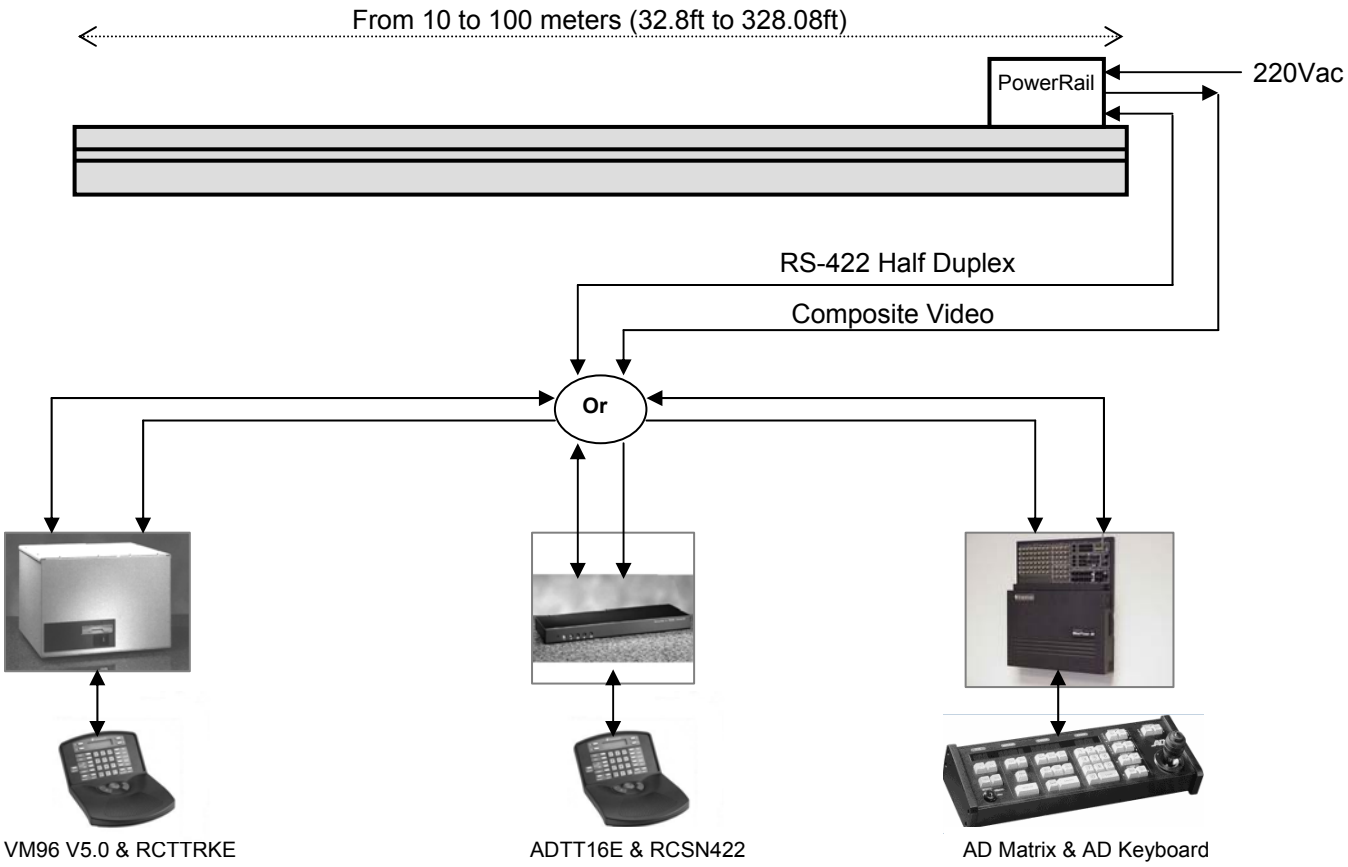
ATMEGA 128 block diagram



Vision area (for surveillance), dead zones (for stopping), and maintenance areas (for servicing)



Interconnection



Matrix Compatibility

	Movements	Presets	Patterns
VM16 / ADTT16 (**)(***)	Yes	4	3
VM96	Yes	Unlimited	3
AD2150 (*)	Yes	16	3
AD168	Yes	4	3
AD1024 (*)	Yes	16	3
MP48	Yes	4	3

* Requires AD2083-02AX code translator.

** Requires RCSN422 code translator.

*** Including remote control via Intellex™ and Network Client™

Preventive Maintenance

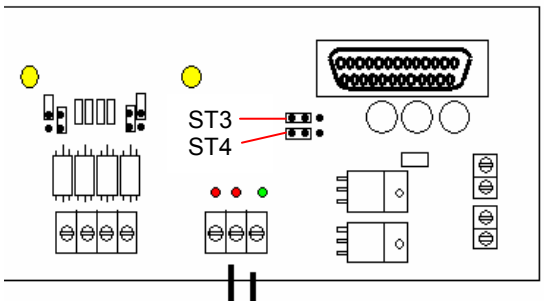
Preventive maintenance helps prevent malfunctions and safety-related issues. Maintenance is performed by a functional check, and if necessary, cleaning.

Functional Check

To detect unusual rail operation, a functional check should be performed using AD SensorRail™ Control software before and after maintenance.

Procedure

1. Connect the communication cable (DB25-DB9) between your laptop and the PowerRail module. Move jumpers ST3 and ST4 in the module to the PC position before launching AD SensorRail Control software.



2. Using the software, run the trolley to observe possible failures such as power dropouts, picture instability, and inaccurate presets.
3. Double click the Output 2 LED to view “kilometers” on the main window.
4. Check every function, especially presets and patterns.
5. Check optical stop detection (see CAUTION below). The dome can be oriented to see the function LEDs on the CPU board.

CAUTION: Do not run the trolley at full speed in case of detection failure.

6. Check the DATA link (in and out). Communication LEDs can be seen from the Dome.
7. Write down all failures.

Structure Check and Maintenance

1. Using a soft cloth soaked **with isopropyl alcohol**, clean the following rail parts:
   - Copper tracks (use a screwdriver to insert the cloth into the PVC holder.
   - Clean the aluminum where optical encoders read along the rail.
2. Using a dry, soft cloth **without alcohol**, clean the cowling as follows:
   a. Detach one side of the cowling from the rail by inserting a plastic “credit card like” card into the cowling groove at the start of the rail and pulling it gently along the cowling.
   b. Using a soft cloth, gently wipe off dust from the inside of the cowling.

CAUTION: Do not press hard on the cowling to avoid scratching it.

3. Check the following parts:
   - Rail junctions/jointing plates
   - Nuts securing the M8 rods to the stirrups
   - Tension of anti-sway cables
   - Receiving antenna fixture.

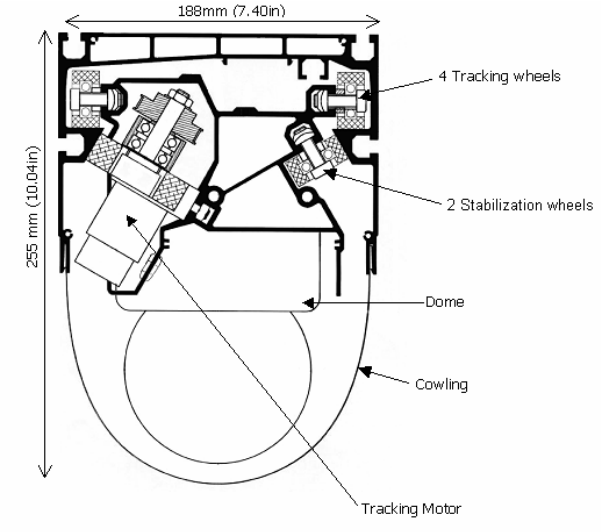
Trolley Check and Maintenance

1. Using a soft cloth soaked with alcohol, clean the following trolley parts:
   - Tracking wheels (4)
   - Stabilization wheels (2)
   - Pressure roller (1)
   - Sliding contacts (4).
2. Using a soft cloth dry clean (without alcohol) the following trolley parts:
   - Optical sensors
   - Dome lens.
3. Check wear on the following trolley parts:
   - Wheels (tracking and stabilization)
   - Sliding contacts
   - Pressure roller belt wear
4. Perform an overall check of trolley parts such as collectors and pantographs.

Guiding and Stabilizing Wheels

Tracking and stabilizing wheels absorb vibrations and force coming from the trolley movement and rail junctions.

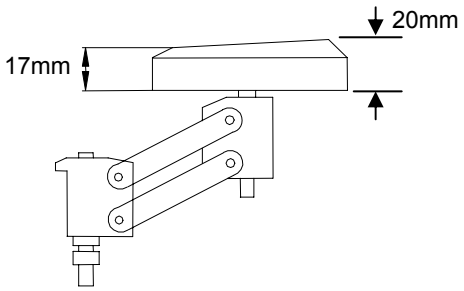
Estimated lifetime for these wheels is 10000km; therefore, no replacement should be expected. However, for safety reasons, check for lateral excess movement of the bearings.



Sliding Collectors

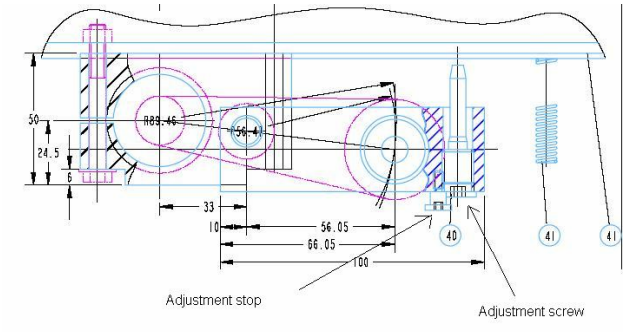
When copper collectors are worn, the plastic support can slide against the PVC holder. This will generate noise and dust and can potentially deteriorate the PVC holder.

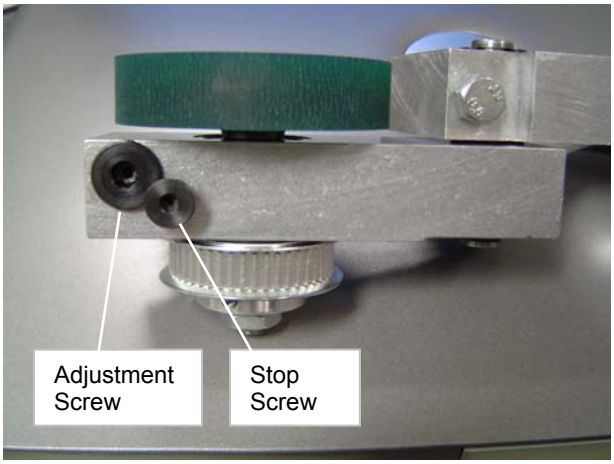
Check the height between the contact surface and the bottom of the plastic support. New contacts are 20mm thick. As shown below, if the collector is worn more than 3mm, replace it. Estimated lifetime for contacts is 8000km.



Drive Wheel Adjustment Screw

The drive wheel adjustment and stop screws allow a range of adjustment for best performance. After adjustment, if the trolley still does not meet specifications, change the motor or motor drive wheel.





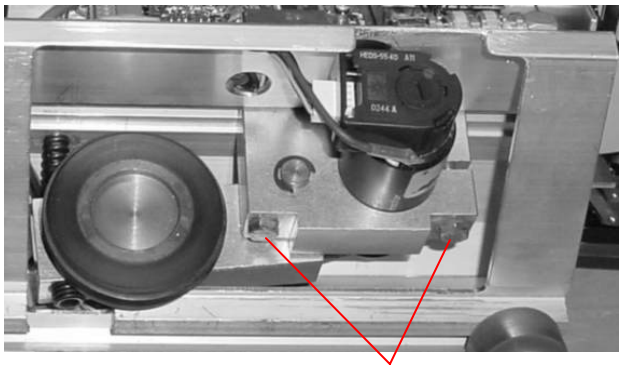
Roller Belt Tension

Roller belt tension must be correct. Too tight, the belt will generate rolling noise; too loose, the gears could ruin the belt resulting in trolley positioning problems.

Visually check belt tension by pressing the belt with your finger. If tension is correct, the belt should deflect no more than 1cm.

There is no adjustment available for belt tension. When the belt is too loose, replace it as follows:

Removing the motor assembly:



M6 Retaining Screws

1. Mark the position of the old motor to ensure the new motor is installed in the same location.
2. Remove the two M6 screws at each end of the motor support.
3. Pull out the motor assembly from the trolley
4. Remove the belt from the motor gear.

Re-installing the motor assembly:

1. Install a new belt and place the motor assembly in its groove.
2. Re-install the M6 retaining screw to the left in the picture. Do not secure it yet.
3. Re-install the M6 retaining screw to the right in the picture. Do not secure it yet.
4. Adjust the position of the motor using the mark made during the removal process.
5. Securely tighten both screws ensuring the motor is still in place.

Servicing

Firmware Upgrade

To improve motor management and product reliability, SensorRail III firmware was redesigned. Version 5.56 offers the following enhancements:

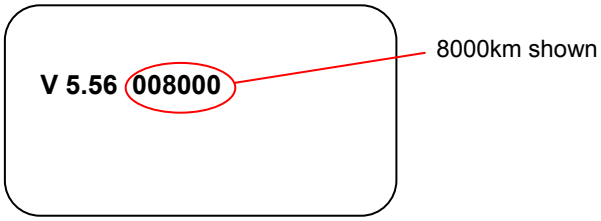
- Improved motor management avoids excessive power usage and increases product reliability by preventing motor burn out.
- Electronic motor brake provides increased security in case of CPU failure.
- Motor management enables up to 3m/s (9.84ft/s) nominal speed and up to 6m/s (19.69 ft/s) on target, versus 2m/s (6.56ft/s) and 4m/s (13.12ft/s) with SensorRail II.
- Dead zone reduced from 5m (16.4ft) to 3m (9.84ft) at each end of the rail by implementing an acceleration and deceleration ramp on the motor; also allows full use of rail length.
- Firmware upgrade via EPROM flash provides an effective way to keep up with the latest version.

Like the SensorRail II, this software provides the functionality of the SpeedDome Ultra VII with the exception of privacy zones, competitor's protocols, freeze frame, direction indicator, iris and home position. Main software functionalities include: pan, tilt, zoom, presets (matrix dependent), patterns (maximum of 3), and sequences.

SensorRail III firmware was written using C++™. Please refer to manufacture files for complete details of the firmware.

SensorRail III CPU firmware upgrade ADRL3ESW4 provides four new functions for the trolley.

- Aux 1 resets the trolley to off.
- Aux 2 displays the software version and trolley travel, in kilometers, on the video screen for about 5 seconds. For example:



Note: Turn Aux Output 2 off after viewing to return to control of trolley movement.

- Aux 3 or 4 enables access to the dome camera menu.

  Note: Turn Aux 3 or 4 off after viewing to return to control of trolley movement.
- Supports new RS-422 command for expanded presets up to 16.

Firmware upgrades are performed by flashing memory in the ATMEGA microcontroller.

- Firmware upgrades are performed by EPROM flash using a standard communication cable and a laptop. To perform this operation, a software utility distributed to certified Tyco personnel and certified dealers is required.
- Memory flash application supports Windows 2000 and Windows XP Pro.
- Standard serial COM port is required to communicate with the ATMEGA in the CPU.
- Exit all other programs and disable anti virus software while loading.

Compatibility: SensorNet to RS-422 code converter requires upgrading to 0701-2814-0102. This also supports MegaPower LT Version 1.1.11 and higher.

Note: New trolley software is based on software used with the USB controller called AD SensorRail Control, product code ADRL3ESWCU, and is not compatible with SoftRail™ software. Obtain new trolley software from Tech Support.

Note: The flash utility will still work. However, in some cases, lock bits for flashing the chip are set wrong. If flash programming fails, order a new board.

Note: To avoid unnecessary trolley retrieval, always flash the trolley at the start of the rail.

Parts Required

- Serial communications cable (DB25 to DB9)
- AD SensorRail Control software.

Application Installation

Run the **SETUP.EXE** located on the directory INSTALLER\DISK.

Installation is performed in two steps:

1. LabView engine installation (automatic)
2. **ProgChariotV3.exe** installation.

The host computer does not need to be rebooted at the end of the installation process.

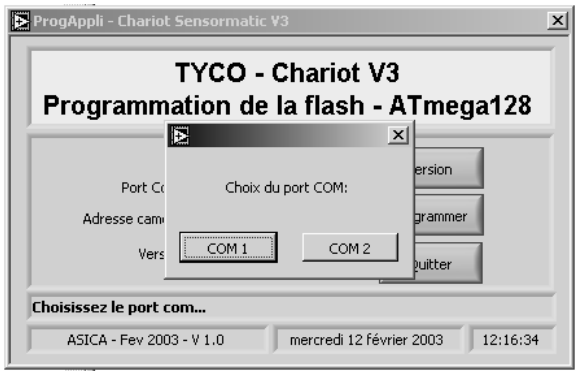
Application Start-up

1. Connect the laptop communications cable to the DB25 plug on the PowerRail communication board.

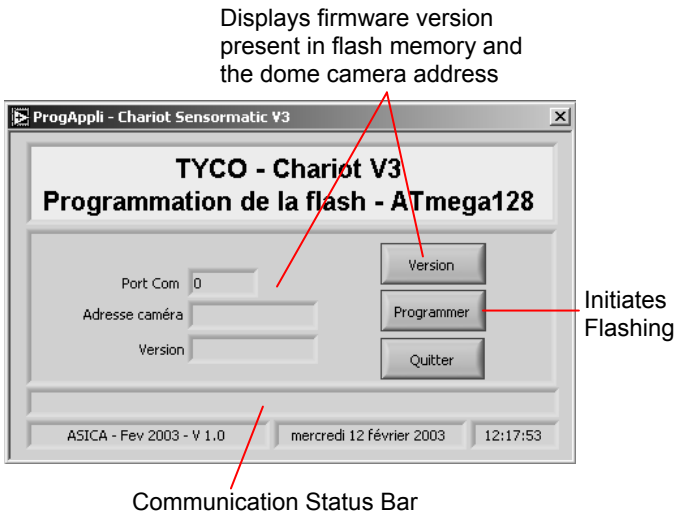
   Note: To avoid moving jumpers in the PowerRail module, an alternate method is to use an RS-232 to RS-422 converter from the control room where the RS-422 terminates. However, only the rail being upgraded can be connected to the converter. DO NOT connect other domes or trolleys.

2. For RS-232 mode only, move jumpers ST4 and ST5 to the PC position.

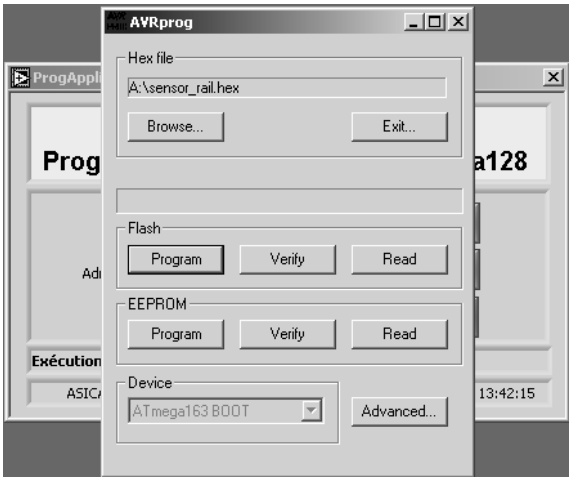
3. Launch the **ProgChariotV3.exe** application. The following window appears:



4. Select the COM port to which the communications cable is connected. Once done, the COM port window will close. The picture below shows application functions.



5. Select the PROGRAM button. The AVRprog window appears:



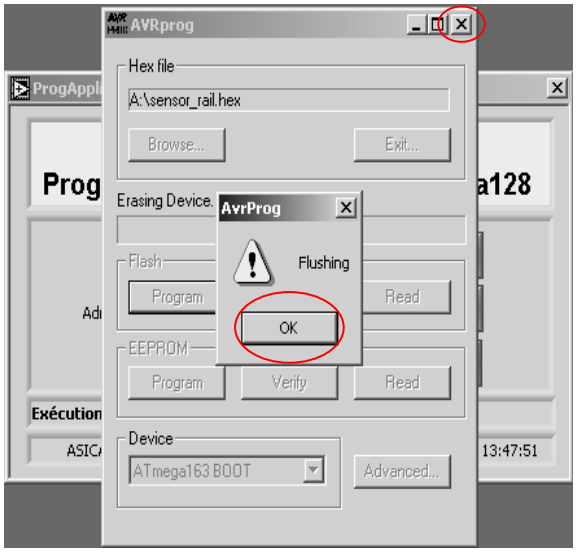
6. The trolley's CPU is now in boot mode, and the two red LEDs should light.

7. Using the BROWSE button, select the firmware (.HEX) file you want to flash into the ATMEGA.

8. When the correct firmware file selected, click the PROGRAM key. The message PROGRAM ERASE appears in the communication status bar. The erroneous message “Erasing failed” will also occur (wait for message to go away).

9. Click the PROGRAM key again. The message ERASE…DEVICE…PROGRAMMING appears.

   After a few seconds, the following window appears:



10. Click OK to initiate flashing. A bar graph shows the progress.

11. Close the application by clicking the X in upper right corner (not the EXIT key). The firmware has now been upgraded and the trolley will perform a reset.

    Note: There is no need to re-boot the computer.

12. Launch AD SensorRail Control software to verify the firmware has been correctly flashed into the ATMEGA microcontroller. Check the firmware version by toggling Aux Output 2 on and off, and then click Calibrate Rail to enable the trolley learn the rail length.

13. Test the forward and reverse function of the trolley.

14. If the RS-232 mode was used, ensure jumpers ST4 and ST5 are moved back to RS-422 control.

Motor Replacement

The motor is located at the rear drive wheel of the trolley. Replacement motor ADRL3MOTORP is shipped with the encoder installed.

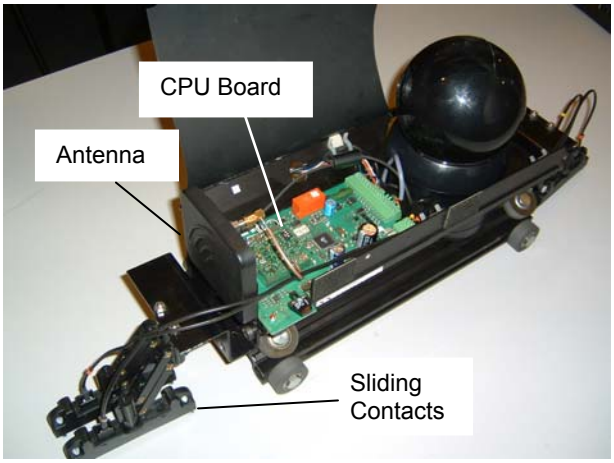
To replace the motor:

1. Mark the position of the old motor to ensure the new motor is installed in the same location.
2. Unscrew the two M6 screws at each end of the motor support.
3. Unplug the encoder cable.
4. Disconnect the motor wires from the main connector on CPU board (pins 12 and 16).
5. Pull out the motor assembly from the trolley.
6. Remove the belt from the motor gear.
7. Pull out the motor from its support.
8. Remove the gear from the motor axle using an M3 Allen wrench.
9. Remove the thermoplastic insulation from each wire and de-solder them from the motor.
10. Re-solder the wires on the new motor (note polarity on the motor body).
11. Re-install new 2cm (5in) thermoplastic insulation.
12. Re-install the gear on the motor axle. Secure the M3 Allen screw.
13. Re-install the motor into its support.
14. Reconnect the encoder plug.
15. Re-install the belt on the motor gear.
16. Re-install the motor support on the trolley.
17. Re-install the M6 retaining screw (the left one in the picture), but do not secure it yet.
18. Adjust the motor position by sliding it into its support so that the belt is located in the middle of each gear (motor & pressure roller).
19. Re-install the M6 motor retaining screw to the right (see picture on page 14) and tighten the screw.
20. Tighten the left retaining screw.
21. Reconnect the motor wires to pins 12 and 16 of the main connector on the CPU board.

CPU Board Replacement

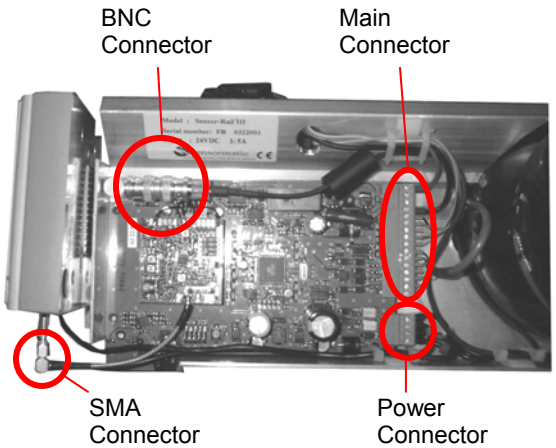
The trolley CPU board is installed in the bottom of the trolley. It is secured by the corner supporting the rear sliding contacts and by the RF antenna.

The corner supporting contacts, rear sliding contacts, and antenna are held by two Allen screws behind the antenna.



To remove the CPU board:

1. Remove the antenna from its support by removing the two bolts.
2. Detach the SMA connector from the antenna.
3. Remove the two Allen screws using an M6 Allen wrench to detach the bracket from the trolley. Pay attention to the sliding contacts. The connection wire can easily loosen.
4. On the CPU board, disconnect the main connector, power connector and the BNC for the video. Then pull out the board from its grooves.



To install the new CPU board, reverse the above procedure.

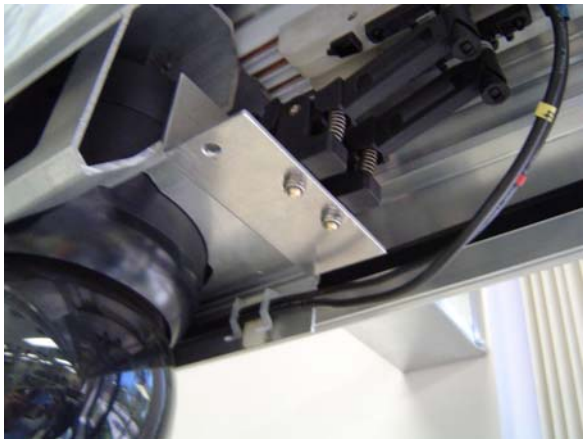
Replacing/Retrofitting Collectors, Wires, Brackets

1. Remove the trolley from the rail and carefully place it on its side. Locate the 4-pin connector, and mark the collector numbers on the trolley brackets so the wires can be replaced in the correct order. Wire labels should match the numbers marked on the brackets.

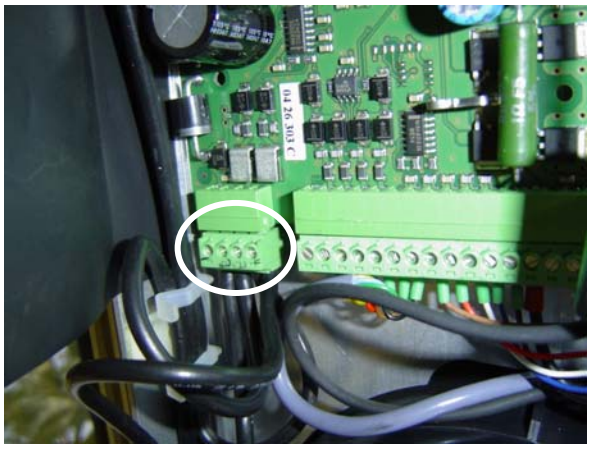
   Note: The picture shows bare aluminum brackets; the shipped product will be black.

2. Open the black cover and remove the old brackets using an Allen wrench. Leave the old collectors on their brackets.
3. Remove the number sleeves from the old wires and place them on the new wires.
4. Transpose the numbers recorded on the old brackets to the new brackets.
5. Install new mounting studs on the new brackets using M5 nuts. Snap the new collectors on the mounting studs.
6. Install the new brackets, ensuring the Tx antenna mounts to the bracket that has three bends to hold the antenna at the correct height.

The smaller bracket mounts on the other side of the trolley.



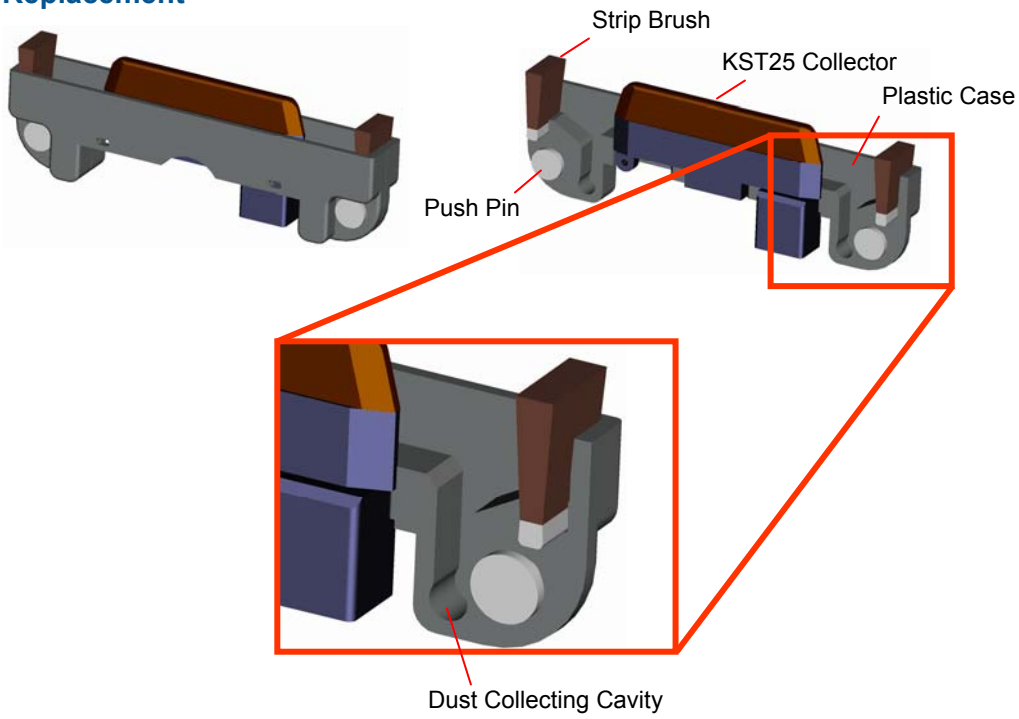
7. Route wires into place and attach them to the 4-pin connector shown below and to the collectors. Cut wires to length on the open end.



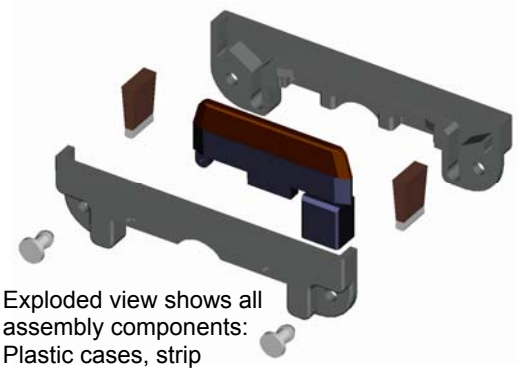
8. Secure the black cover, and check the connections and numbers.

KST25DC Dust Collector Kit

Replacement

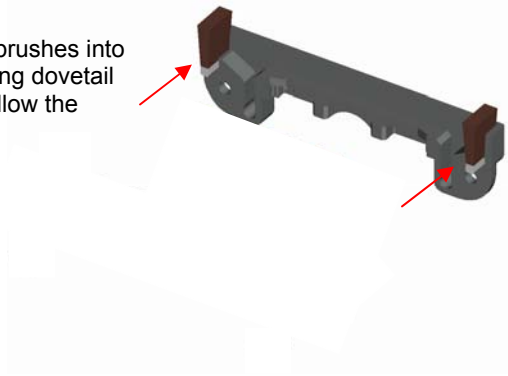


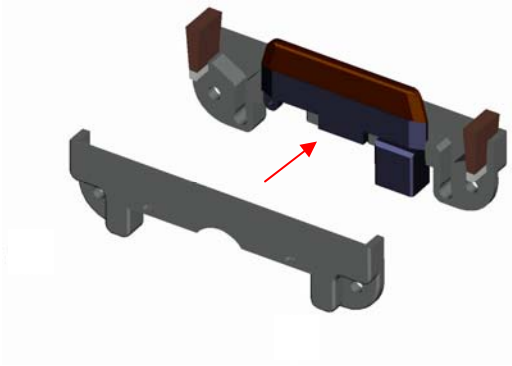
Assembly Process



Exploded view shows all assembly components: Plastic cases, strip brushes, KST25 collector, and push-pins.

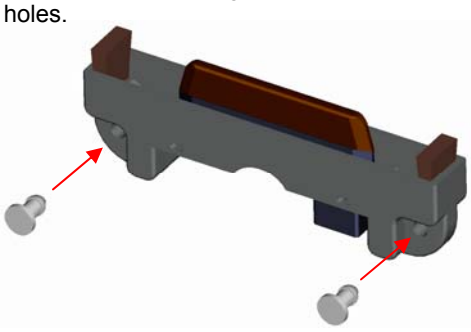
1. Insert strip brushes into corresponding dovetail pockets. Follow the arrows.

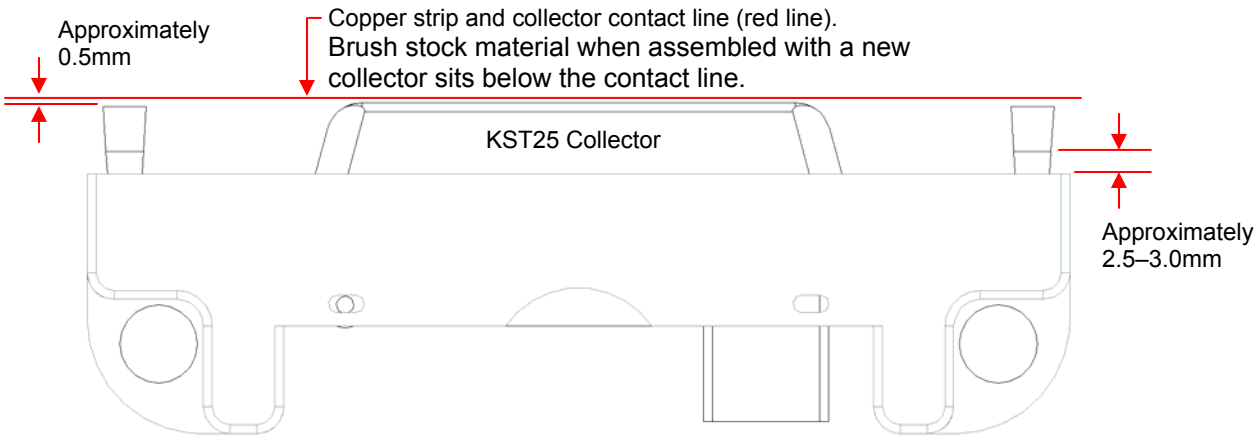




2. Insert the KST25 collector as shown. Then mate the other half of the plastic case to the assembly. Carefully align the dovetail pockets with the strip brushes.

3. Secure the assembly by snapping push-pins into the corresponding holes.



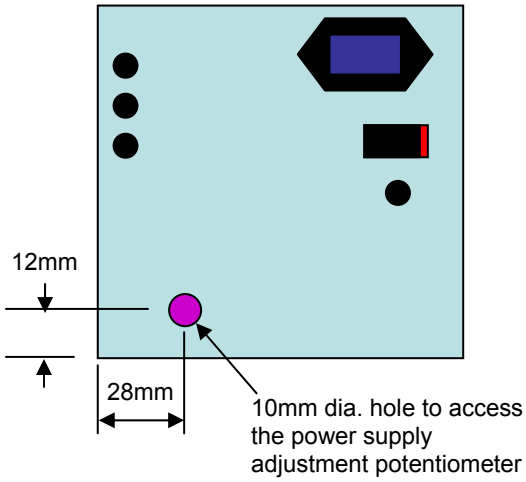


Note: If collectors are worn-out, before installing new brushes, trim brush hair approximately 0.5mm.

Power Supply Modification and Adjustment

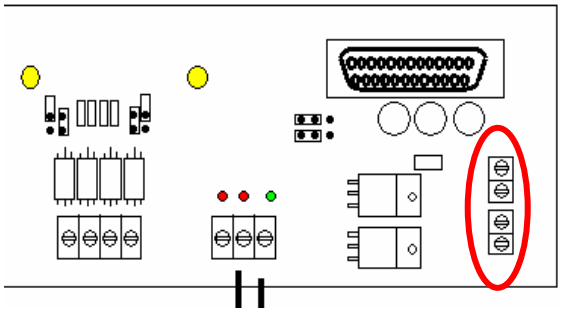
WARNING! Unplug the power cord to the PowerRail module to ensure there is no power to the rail.

1. Using the template below to determine the hole location, drill a 10mm hole in the PowerRail module to gain access to the adjustment screw.
   - About 5mm up the drill bit, wrap tape approximately 10 times around the bit to stop it so it does not go too deep into the enclosure.
   - Grease the bit or use a vacuum close to the bit while drilling to prevent metal filings from getting into the enclosure.



The PowerRail module is shown below with the new access hole. Note plastic screws and thick washer in plastic used to isolate the power supply from the rail. This prevents multiple ground paths if you have RF video issues.

2. After drilling, clean filings from the area.
3. Reconnect wires and turn on the PowerRail module. The trolley should perform its power-up routine.
4. Using a voltmeter set to dc (Track 1 = voltage, Track 2 = Gnd), connect its probes to the contacts shown below. Then using a small screwdriver, adjust the potentiometer to 27Vdc maximum.



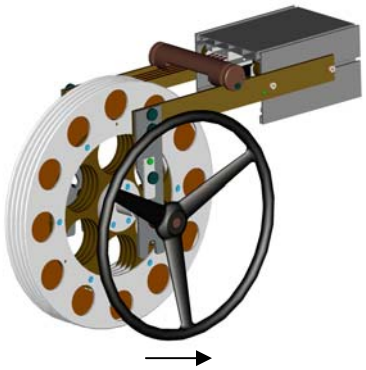
5. Test the trolley's motion to the furthest point and back.

   Note: Because the PowerRail module RS-422 output is not tri-state, additional devices cannot be daisy-chained or parallel-wired to the rail. Instead, connect the rail to separate channels on an RS-422 system, or use an RS-422 junction box.

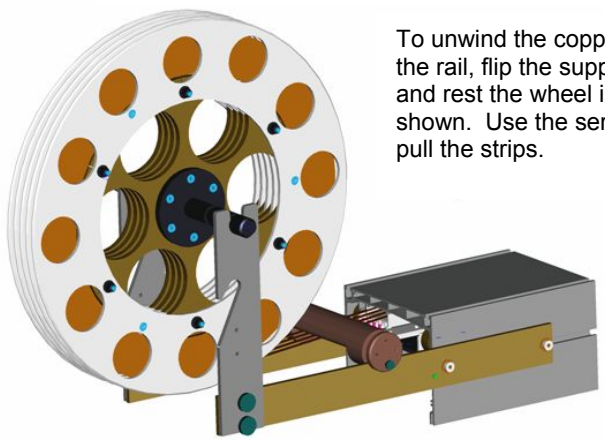
Copper Install Tool ADRLCIT

This tool is used to install new copper strips and also reverse old copper strips due to green patina from previous collectors that ran over it. The latest tool is turned using a wheel instead of handles.

COPPER STRIP INSTALLATION/MAINTENANCE KIT

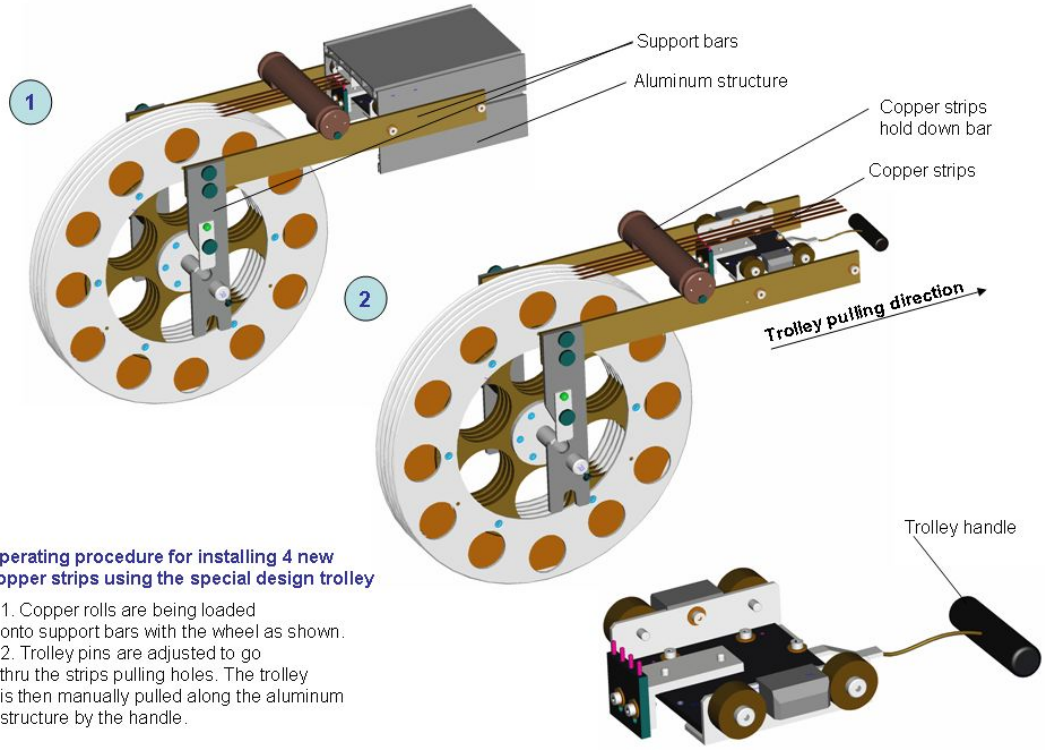


To wind the existing copper back on to the wheel, rotate the wheel in the direction of the arrow shown above.



To unwind the copper back into the rail, flip the support bars 180° and rest the wheel in the slot as shown. Use the service trolley to pull the strips.

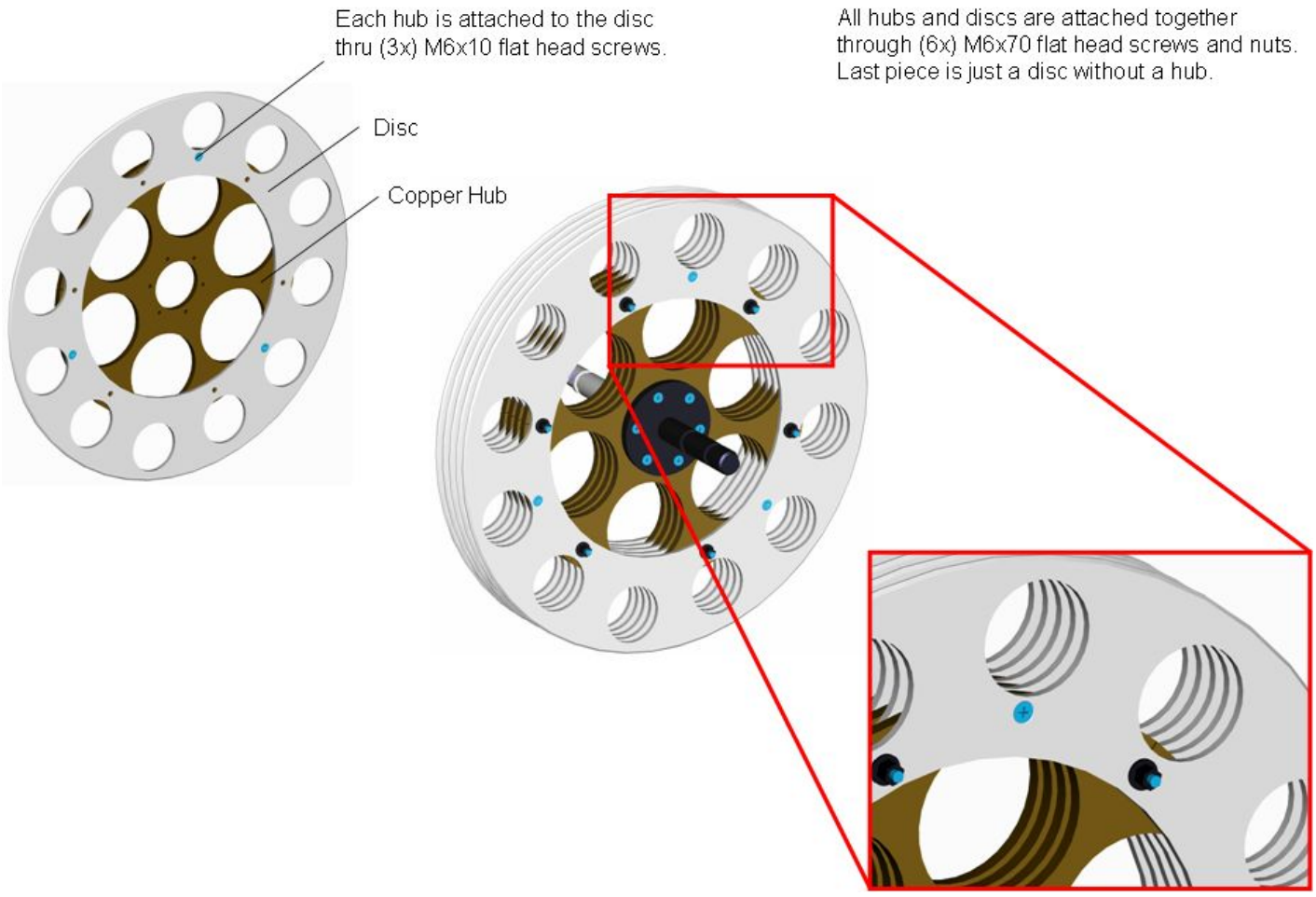
COPPER STRIP INSTALLATION/MAINTENANCE KIT



Operating procedure for installing 4 new copper strips using the special design trolley

1. Copper rolls are being loaded onto support bars with the wheel as shown.
2. Trolley pins are adjusted to go thru the strips pulling holes. The trolley is then manually pulled along the aluminum structure by the handle.

COPPER STRIP INSTALLATION/MAINTENANCE KIT



COPPER STRIP INSTALLATION/MAINTENANCE KIT

Installation tools required:

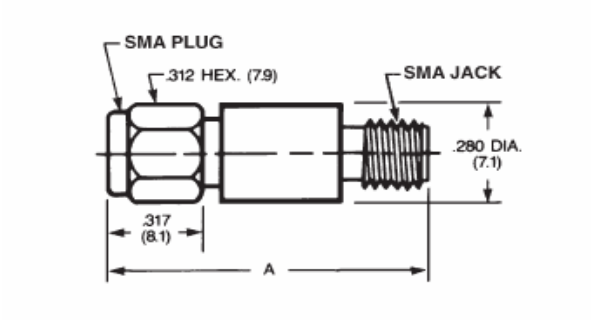
1. Hand punch tool (see Fig.1 & 2). to punch a 4mm diameter hole into the copper strips
2. Allen wrench set – hex keys
3. Adjustable wrench
4. Power drill with accessories (drills, flat and Philips drive-heads)
2. Self taping screws

Fig.1

Fig.2

RF Attenuator

(dc to 6GHz usable)



The RF attenuator is located at the transmit antenna on the trolley.

CAUTION: The attenuator is required to comply with the CE regulation.

Rail Distance	RF Attenuator	Part Number
10–45m	30dB	ADSMA30DB
50–75m	20dB	ADSMA20DB
75–100m	10dB or 15dB	ADSMA10DB ADSMA15DB

Note: There are environmental circumstances that may require a different value.

Light Reduction Kit

SR3-END-COVER and ADRL3BUL3.5U

This kit prevents light reflections from entering the cowling from each end of the rail.

1. Mount the ection onto the existing rail using the hardware provided.
2. Attach the top hat to the top of the section to cover the large cutout.
3. Add extra cowling to the rail structure.
4. Attach the new end cover.

Note: be sure to follow the installation guide for minimizing light reflections into the cowling.

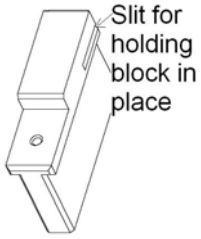
IMPORTANT! Ensure the customer understands that if installation requirements are not met, some light reflections cannot be removed from the picture on the video monitor.

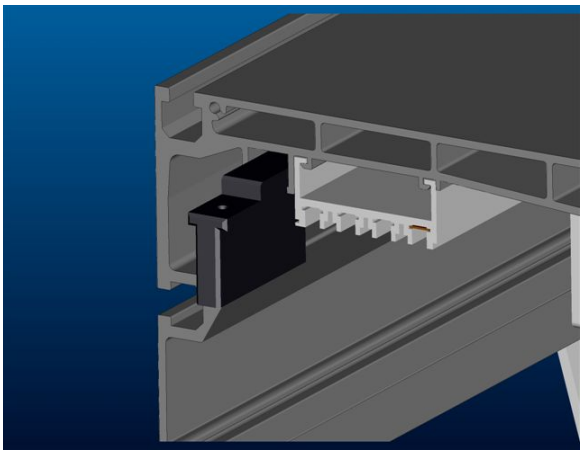
Trolley Retrieval Tool

ADRLSTBL100 and ADRLEST

The trolley retrieval tool (also called the end stop/strap tool) enables a technician to pull the trolley back without removing the cowling when the trolley does not return to the start end of the rail.

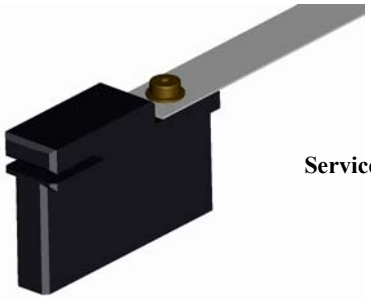
1. At both ends of the rail, remove the stop screw and slide out the spring and old stop block.
2. At the end of the rail, insert the new service block.
3. Remove the camera trolley.
4. Fold the end of the strapping tape ¾ inch back on itself. Then use a soldering iron to make a hole in the folded tape.
5. Attach the strapping tape to the new service block using an M3 screw.
6. With the strap facing the start end of the rail, slide the block by hand into the stop groove for about 50cm (20in).
7. Slide the trolley into the rail as far as it will go. The strap should also slide.
8. At the start end of the rail, insert the slit of the second service block into the stop groove to hold the tape above it.





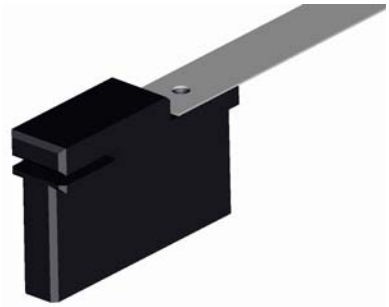
9. Let the roll of strap uncoil to the floor, and very carefully, power up the rail. As the trolley homes, it will pull some of the strap into the rail.
10. After the trolley homes, use AD SensorRail Control software to set the maximum speed to 1m/s (3.3ft/s) so the trolley slowly pulls the block and strap to the end of the rail. When done, return the speed to 3m/s (9.8ft/s).
11. Once the trolley reaches the end of the rail, remove the service block holding the tape at the start end of the rail, turn the block around and reinsert it into the stop groove, followed by the spring and stop screw. Once this assembly is installed, tighten the stop screw.
12. If the trolley requires service and does not return to the start end of the rail, remove the stop screw and spring at the start end and pull the strap to move the trolley to the start of the rail. Then, follow the steps above to reinstall the strap.

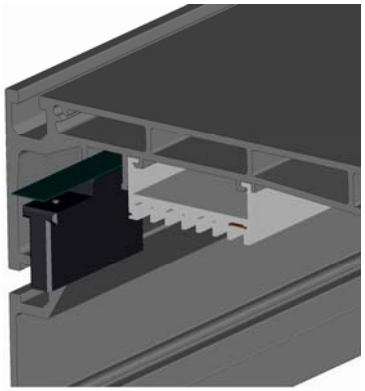
SR3 SERVICE ASSEMBLY



Service block

Note: Do not punch hole into strapping tape! Material will break! Instead use a soldering iron to burn the hole into the tape.





Tape feeding procedure

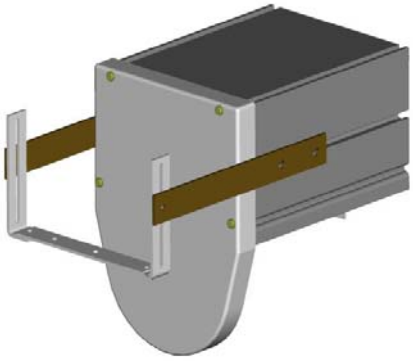
Service block slot feature to be used to secure second block on the aluminum structure while feeding the tape attached to the other one.

Antenna Bracket Replacement

Plastic bracket ADRL3RXBRK enables the RF receive antenna to be placed inside or outside the structure depending on installation requirements.

Note: The installation kit contains hardware to mount the receive antenna to the black bracket. Ensure the bracket is installed so the antenna is in line with the transmit antenna of the trolley.

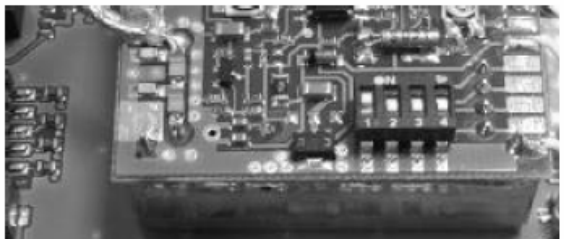
1. Insert the bracket 15cm into the rail. This bracket enables the antenna to be easily moved to where the least number of RF holes exist.
2. If RF holes cannot be eliminated, move the antenna to the outside of the rail.
3. Ensure that the RF antenna does not receive transmissions from another system. If it does, select a different transmission frequency.



RF Link DIP Switch Settings

If 2.4GHz devices interfere with the SensorRail, select one of the following alternate frequencies using the four-position DIP switch located on the transmitter board of the trolley.

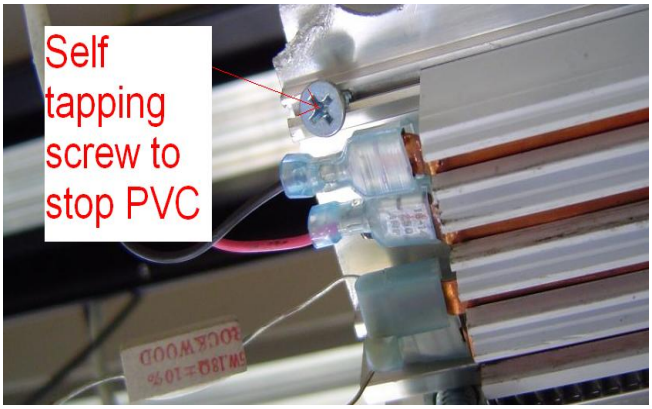
	DIP Switch			
Channel	**1**	**2**	**3**	**4**
Channel 1 (2414.5MHz)	ON	OFF	OFF	OFF
Channel 2 (2428.5MHz)	OFF	ON	OFF	OFF
Channel 3 (2442.5MHz)	ON	ON	OFF	OFF
Channel 4 (2456.5MHz)	OFF	OFF	ON	OFF
Channel 5 (2470.5MHz)	ON	OFF	ON	OFF



Self-Tapping Screw Installation

Two self-tapping screws, one at each at each end of the rail, prevent the PVC holder from coming out of the rail.

Using a drill with a Phillips bit, thread each screw into the rail as shown below. Ensure the screw does not touch the copper or connector at the start and end of the rail.



End Cover Replacement

If RF video dropouts occur, use the black plastic end cover ADRL3ECB. Affix the plastic cover using the same screws that held the metal version.

CAUTION: The black cover is only used with the new rail extension containing the top hat. DO NOT use this cover without the rail extension. See “Light Reduction Kit” on page 25.

Ordering Parts

The list below shows parts available for service. Please contact local marketing for price and delivery time.

Product Code	Description
Trolley	
ADRL3EVCUPE	SensorRail III, fully equipped trolley, with 2.4GHz HF transmitter, Dome VII, PAL
ADRL3WHEELSP	SensorRail III, 4 trolley wheels, universal
ADRL3DRVSYSP	SensorRail III, driving system, with pressure roller, mount, universal
ADRL3MOTORP	SensorRail III, motor, universal
ADRL3DRVACCP	SensorRail III, driving system accessories, with gear & belt, universal
ADRL3CMF25U (OBS)	SensorRail III, sliding contact, universal
ADRL3CPUU	SensorRail III, CPU board, PAL
ADRL3RFT24P	SensorRail III, RF link, transmitter 2,4GHz, PAL
ADRL3ATEN24U	SensorRail III, RF transmitter antennas 2,4GHz , PAL
ADRL3RFT58P	SensorRail III, RF transmitter 5,8GHz, PAL
ADRL3ATEN58U	SensorRail III, PowerRail, RF antenna transmitter 5,8GHz, PAL
KST25	Set of 4 copper/graphite collectors
KST25DC	SensorRail III dust collector kit
KST25-BRKFR	Bracket for the SensorRail KST25 collectors front 3 bends
KST25-BRKR	Bracket for the SensorRail KST25 collectors rear 2 bends
ADRL3RXBRK	Rx antenna black plastic kit with screws
ADRLCIT	SR3 copper install tool
ADRLEST	SR3 end stop/strap tool
ADRLSTBL100	Strapping tape black, 100m (328.1ft)
ADSMA10DB	SR3 RF attenuator 10dB Tx Ant
ADSMA15DB	SR3 RF attenuator 15dB Tx Ant
ADSMA20DB	SR3 RF attenuator 20dB Tx Ant
ADSMA30DB	SR3 RF attenuator 30dB Tx Ant
ADRL3ESWCU	AD SensorRail control utility version 1.0 (available from Tech Support only)

PowerRail	
ADRL3PWRLP	SensorRail III, PowerRail complete, 27Vdc, with RF receiver, antenna PAL
ADRL3PWROP	SensorRail III, PowerRail only 27Vdc, PAL
ADRL3PWRRECP	SensorRail III, PowerRail, RF receiver 2,4GHz, PAL
ADRL3PWRANTP	SensorRail III, PowerRail, RF receiver antenna 2,4GHz, PAL
ADRL3PWRR58P	SensorRail III, PowerRail, RF receiver 5,8GHz, PAL
ADRL3PWRA58P	SensorRail III, RF antenna receiver 5,8GHz, PAL

Product Code	Description
Rail	
ADRL3TRACKU	SensorRail III, full rail 5m (16,4ft), with PVC holder, 4 jointing plates, 2 stirrups
ADRL3TRACK5U	SensorRail III, rail only 2,5m x 2, with 4 jointing plates, 18 screws, universal
ADRL3FE901U	SensorRail III, PVC holder 2,5m x 2, universal
ADRL3ETRIERU	SensorRail III, 2 stirrups, universal
ADRL3RESORTU	SensorRail III, C125-180-360, 4 springs, universal
ADRL31350U	SensorRail III, 2 N°1350, universal
ADRL3OPTICU	SensorRail III, optical strip (7,5 meters), universal
ADRL3UNVI55U	SensorRail III, copper, VA860/8-55, universal
ADRL3UNVI90U	SensorRail III, copper, VA860/8-90, universal
ADRL3UNVI100U	SensorRail III, copper, length >100m, universal
SR3-END-COVER	Sensor Rail 3 NEW end covers and accessories.
ADRL3ECB	SR3E end cover black plastic kit
ADRLEST	SR3 end stop/strap tool
ADRLSTBL100	Strapping tape black, 100m (328.1ft)
ADRL3-AUX-BRK	Aux bracket kit stirrup

Copper Track	
ADRL3CUI10U	SensorRail III, copper tracks 10m (32,81ft), 4 rolls of 10m, universal
ADRL3CUI15U	SensorRail III, copper tracks 15m (49,21ft), 4 rolls of 15m, universal
ADRL3CUI20U	SensorRail III, copper tracks 20m (65,62ft), 4 rolls of 20m, universal
ADRL3CUI25U	SensorRail III, copper tracks 25m (82,02ft), 4 rolls of 25m, universal
ADRL3CUI30U	SensorRail III, copper tracks 30m (98,43ft), 4 rolls of 30m, universal
ADRL3CUI35U	SensorRail III, copper tracks 35m (114,83ft), 4 rolls of 35m, universal
ADRL3CUI40U	SensorRail III, copper tracks 40m (131,23ft), 4 rolls of 40m, universal
ADRL3CUI45U	SensorRail III, copper tracks 45m (147,64ft), 4 rolls of 45m, universal
ADRL3CUI50U	SensorRail III, copper tracks 50m (164,04ft), 4 rolls of 50m, universal
ADRL3CUI55U	SensorRail III, copper tracks 55m (180,45ft), 4 rolls of 55m, universal
ADRL3CUI60U	SensorRail III, copper tracks 60m (196,85ft), 4 rolls of 60m, universal
ADRL3CUI65U	SensorRail III, copper tracks 65m (213,25ft), 4 rolls of 65m, universal
ADRL3CUI70U	SensorRail III, copper tracks 70m (229,66ft), 4 rolls of 70m, universal
ADRL3CUI75U	SensorRail III, copper tracks 75m (246,06ft), 4 rolls of 75m, universal
ADRL3CUI80U	SensorRail III, copper tracks 80m (262,47ft), 4 rolls of 80m, universal
ADRL3CUI85U	SensorRail III, copper tracks 85m (278,87ft), 4 rolls of 85m, universal
ADRL3CUI90U	SensorRail III, copper tracks 90m (295,28ft), 4 rolls of 90m, universal
ADRL3CUI95U	SensorRail III, copper tracks 95m (311,68ft), 4 rolls of 95m, universal
ADRL3CUI100U	SensorRail III, copper tracks 100m (328,08ft),4 rolls of 100m, universal
ADRLCIT	SR3 copper install tool

Product Code	Description
Mirrored Cowling	
ADRL3BUL10U	SensorRail III, mirrored cowling 10m (32,81ft), universal
ADRL3BUL15U	SensorRail III, mirrored cowling 15m (49,21ft), universal
ADRL3BUL20U	SensorRail III, mirrored cowling 20m (65,62ft), universal
ADRL3BUL25U	SensorRail III, mirrored cowling 25m (82,02ft), universal
ADRL3BUL30U	SensorRail III, mirrored cowling 30m (98,43ft), universal
ADRL3BUL35U	SensorRail III, mirrored cowling 35m (114,83ft), universal
ADRL3BUL40U	SensorRail III, mirrored cowling 40m (131,23ft), universal
ADRL3BUL45U	SensorRail III, mirrored cowling 45m (147,64ft), universal
ADRL3BUL50U	SensorRail III, mirrored cowling 50m (164,04ft), universal
ADRL3BUL55U	SensorRail III, mirrored cowling 55m (180,45ft), universal
ADRL3BUL60U	SensorRail III, mirrored cowling 60m (196,85ft), universal
ADRL3BUL65U	SensorRail III, mirrored cowling 65m (213,25ft), universal
ADRL3BUL70U	SensorRail III, mirrored cowling 70m (229,66ft), universal
ADRL3BUL75U	SensorRail III, mirrored cowling 75m (246,06ft), universal
ADRL3BUL80U	SensorRail III, mirrored cowling 80m (262,47ft), universal
ADRL3BUL85U	SensorRail III, mirrored cowling 85m (278,87ft), universal
ADRL3BUL90U	SensorRail III, mirrored cowling 90m (295,28ft), universal
ADRL3BUL95U	SensorRail III, mirrored cowling 95m (311,68ft), universal
ADRL3BUL100U	SensorRail III, mirrored cowling 100m (328,08ft), universal
ADRL3BUL3.5U	3.5 meters mirror cowling to add when using SR3-END-COVER

Specifications
(Excluding Dome Camera)

Operational

Maximum rail length..... 100m (328.1ft)
Video travel distance 97m (318.3ft)
Travel speed:
- Nominal.....3m/s (9.8ft/s)
- Preset.....6m/s (19.6ft/s)
- Preset positioning.....0.3m/s (0.98ft/s)
- Patrol mode.....1.5m/s (4.9ft/s)
- Initialization mode 1m/s (3.3ft/s)

Cowling density..... f0.7–f0.95 (15–16% penetration)
Camera.....See manual supplied with camera
Controller ..... See manual supplied with controller

Electrical

Power requirements:
- Supply voltage (auto switched) ... 90–240Vac, 50/60Hz
- Current (120Vac)..... 5A typical (10A surge)
- Current (240Vac)..... 2.5A typical (5A surge)

RF link transmitter:
- RF frequency range ..... 2.4–2.483GHz (PAL) over 5 channels
- Transmission power .....10mW EIRP
- Video input ..... Composite PAL 1V p-p
- Video bandwidth.....30Hz–5MHz
- Power supply..... 12.8–15Vdc
- Nominal current..... 240mA

RF link receiver:
- RF frequency range ..... 2.4–2.483GHz (PAL) over 5 channels
- Video output..... Composite PAL 1V p-p
- Sensitivity.....–86dBm (21dBµV)
- Power supply..... 8–10Vdc
- Nominal current..... 250mA

Trolley motor:
- Nominal voltage 24Vdc
- Nominal speed ..... 6700rpm clockwise
- Nominal torque.....1250m Nm
- Nominal current (w/o load) 0.120A
- Speed constant 287rpm/V

Cabling

Power .....IEC connector
Video* .....Coaxial RG59/U
RS-422 data .....Cat. 5. 1 x twisted pair, shielded

* KX-6 for <300m from PowerRail to matrix switcher,
KX-8 for <800m from PowerRail to matrix switcher.

Environmental

Operating temperature ..... –10 to 50°C
Storage temperature ..... –20 to 65°C
Rate of change per hour (max.) .....10°C per hour
Altitude (max.)..... 3660m above sea level
Relative humidity.....0 to 95% non-condensing

Mechanical

Single rail section:
- Length 2.5m (8.2ft)
- Width 188mm (7.4in)
- Height (w/o cowling) 141mm (5.6in)
- Height (w/cowling) 255mm (10in)
- Weight 6.7kg/m (14.7 lbs/3.3ft)
- Material..... Extruded aluminum

Cowling material..... 175 micron Polyester film
Trolley (w/dome camera)
- Dimensions (H x W x L).....225 x 131 x 400mm
- Weight ..... 5kg (11 lbs)

Declarations

Regulatory Compliance

Emissions ..... EN 61000-3-2
EN 61000-3-3

Immunity ..... EN 301489-3

Radio ..... EN 300440-2

Safety .....EN 60950
EN 50371

Declarations

Thank you for using American Dynamics products. We support our products through an extensive and worldwide network of dealers. The dealer, through whom you originally purchased this product, is your point of contact if you have a need for service or support. Our dealers are fully empowered to provide the very best in customer service and support. Dealers should contact American Dynamics at (800) 507-6268 or (561) 912-6259 or on the web at www.americandynamics.net.

WARRANTY DISCLAIMER: Sensormatic Electronics Corporation makes no representation or warranty with respect to the contents hereof and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose.

NOTICE: The information in this manual was current when published. The manufacturer reserves the right to revise and improve its products. All specifications are therefore subject to change without notice.

LIMITED RIGHTS NOTICE: For units of the Department of Defense, all documentation and manuals were developed at private expense and no part of it was developed using Government Funds. The restrictions governing the use and disclosure of technical data marked with this legend are set forth in the definition of "limited rights" in paragraph (a) (15) of the clause of DFARS 252.227.7013. Unpublished - rights reserved under the Copyright Laws of the United States.

TRADEMARK NOTICE: *American Dynamics* and *Sensormatic* are trademarks or registered trademarks of Sensormatic Electronics Corporation. Other product names mentioned herein may be trademarks or registered trademarks of Sensormatic or other companies.

MDR 3/06